

***Astrothelium* Eschw. (Trypetheliaceae) in Aotearoa / New Zealand**

**Peter J. de Lange, Andrew J. Marshall,
André Aptroot, Dan J. Blanchon**

<https://doi.org/10.55457/pibdiv.004101>

Astrothelium Eschw. (Trypetheliaceae) in Aotearoa / New Zealand
by Peter J. de Lange, Andrew J. Marshall, André Aptroot and Dan
J. Blanchon is licensed under a Creative Commons Attribution-
NonCommercial 4.0 International Licence.

This publication may be cited as: de Lange, P. J., Marshall, A.
J., Aptroot, A., Blanchon, D. J. (2025). *Astrothelium* Eschw.
(Trypetheliaceae) in Aotearoa / New Zealand. *Perspectives in
Biodiversity*, 4(1): 1–8.

Contact:

www.unitec.ac.nz/ePress

ePress

Manukau Institute of Technology and Unitec

Private Bag 92025, Victoria Street West

Tāmaki Makaurau Auckland 1142

Aotearoa New Zealand



ISSN 3021-114X

Astrothelium Eschw. (Trypetheliaceae) in Aotearoa / New Zealand

Peter J. de Lange^{1*} , Andrew J. Marshall¹ , André Aptroot² , Dan J. Blanchon³ 

Affiliations:

1. Applied Molecular Solutions Research Group, School of Environmental and Animal Sciences, Manukau Institute of Technology and Unitec, Private Bag 92025, Victoria Street West, Auckland 1142, New Zealand
 2. Laboratório de Botânica / Liquenologia, Instituto de Biociências, Bairro Universitário, Campo Grande, Mato Grosso do Sul, Brazil
 3. Auckland War Memorial Museum Tāmaki Paenga Hira, Private Bag 92018, Victoria Street West, Auckland, New Zealand
- * Corresponding author: pdelange@unitec.ac.nz

Associate Editor: Lilith Fisher

Article type: Research paper

Abstract

The presence of *Astrothelium nigratum* (Müll.Arg.) Aptroot & Lücking (Trypetheliaceae) in the lichenised mycobiota of Aotearoa / New Zealand is documented. Furthermore, the lichen described as *Trypethelium bicolor* var. *pyrenuloides* C.Knight in 1884 and treated as *Trypethelium phlyctaena* Fée in the 1985 edition, as *Trypethelium variolosum* Ach. [= *Astrothelium variolosum* (Ach.) Müll.Arg.] in the 2007 edition of the *Flora of New Zealand lichens* (Galloway 2007), and in 2016 as *Astrothelium phlyctaena* (Fée) Aptroot & Lücking, is here treated as a heterotypic synonym of *Astrothelium nigratum*. This action removes *Astrothelium* / *Trypethelium phlyctaena* and *Astrothelium* / *Trypethelium variolosum* from the lichenised mycobiota of Aotearoa / New Zealand. *Astrothelium nigratum* is a widespread, common, though under-collected, lichen of mature forest known from a range of locations in Te Ika-a-Māui / North Island and from at least one location in the northwestern portion of Te Waipounamu / South Island. We assess *Astrothelium nigratum* as 'Not Threatened' using the New Zealand Threat Classification System.

Keywords

Trypetheliaceae, *Trypethelium bicolor* var. *pyrenuloides*, *Astrothelium*, *A. phlyctaena*, *A. nigratum*, lichenised mycobiota, Aotearoa / New Zealand

Introduction

During the collection of crustose lichens from the Tāmaki Makaurau / Auckland region from 2011–2023, an orange–black lichen growing on the trunks of a range of indigenous conifers was frequently encountered. These specimens were consistently sterile, so were known in the field by the tag name ‘Marble Cake’ because of the similarity of the fresh thallus to that type of cake (Figures 1A and 1B). Then, in November 2019, one of us (P. J. de Lange) collected fertile specimens of Marble Cake from Pillar Light Forest, Wharariki, Pūponga Farm Park, in the northwestern portion of Te

Waipounamu / South Island. From those specimens, the first two authors (PdL, AJM) were able to place those collections as close to *Trypethelium bicolor* var. *pyrenuloides* C.Knight, a poorly known lichen generically reported from Te Ika-a-Māui / North Island by Galloway (1985 [therein as *T. phlyctaena*], 2007) as that variety (1985), or as *Trypethelium variolosum* Ach. (2007), or as *Astrothelium variolosum* (Ach.) Müll.Arg. (de Lange et al. 2018). However, as we had not yet seen the type of *Trypethelium bicolor* var. *pyrenuloides* necessary to be certain of our identification, we sent fertile material to the third author (AA), an expert on the Trypetheliaceae, who identified our specimens as *Astrothelium nigratum*

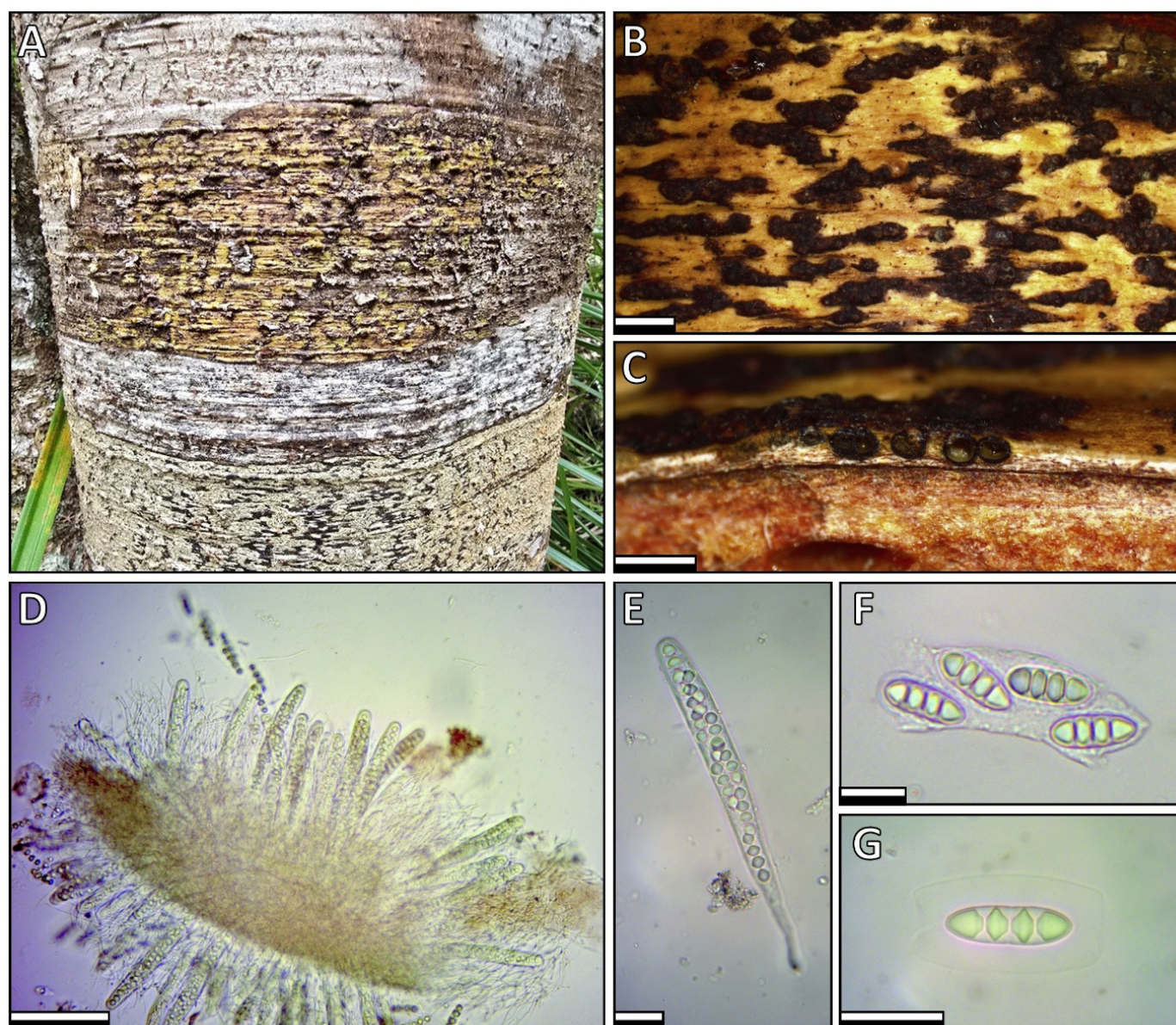


Figure 1. Images of *Astrothelium nigratum*. **A.** Habitus, growing on kauri (*Agathis australis*) at Mataia (Kaipara, near Glorit, Mataia Farm). **B.** Close-up of the thallus (scale = 5 mm). **C.** Cross-section through thallus and ascomata (scale = 2 mm). **D.** Hymenial tissue with numerous asci (scale = 100 µm). **E.** 8-spored ascus (scale = 20 µm). **F.** Spores (scale = 20 µm). **G.** Spore viewed at 1000x magnification showing slightly degraded gelatinous perispore (scale = 20 µm). (Photographs: A. J. Marshall.)

(Müll.Arg.) Aptroot & Lücking, and in the process noted that *Trypethelium bicolor* var. *pyrenuloides* had been considered a synonym of *Astrothelium phlyctaena* (Fée) Aptroot & Lücking, based on Galloway (1985), not of *A. variolosum*. In this paper we provide a treatment of *Astrothelium* Eschw. for Aotearoa / New Zealand, adding a description of the genus and a description of *A. nigratum*, to provide a formal admission of both genus and species into the lichenised mycobiota of Aotearoa / New Zealand. We also lectotypify *Trypethelium bicolor* var. *pyrenuloides* and synonymise this name with *Astrothelium nigratum*, so removing *A. phlyctaena* and *A. variolosum* from the lichenised mycobiota of Aotearoa / New Zealand. A conservation assessment, using the New Zealand Threat Classification System (Rolfe et al. 2022), is provided for *A. nigratum*.

Taxonomy

***Astrothelium* Eschw.**, *Systema Lichenum, Genera Exhibens rite distincta, Pluribus Novis Adaucta*: 18, 26 (1824)

Mycobank registration: MB#443

Type: (fide Aptroot & Lücking 2016) *Astrothelium conicum* Eschw. (= *Astrothelium cinnamomeum* (Eschw.) Müll.Arg.)

= *Astrothelium cinnamomeum* (Eschw.) Müll.Arg., *Flora* 67 (35): 670 (1884)

Mycobank registration: MB#377816

Genus description (from Aptroot & Lücking 2016): *Thallus* corticate, mostly olive-green. *Ascomata* simple, aggregated or forming pseudostromata, immersed to prominent, with the pseudostromata often of a different structure and colour than the thallus, ostioles apical or eccentric, simple or fused, wall hyphal (texture intricate), usually carbonised. *Hamathecium* clear or interspersed with oil droplets, filaments thin, anastomosing paraphysoids. *Ascospores* distoseptate, hyaline, transversely septate or muriform. *Pycnidia* occasionally present. *Chemistry* Lichexanthone, red crystals and/or anthraquinones regularly present, in or on the thallus, pseudostromata and/or ostioles.

Distribution (fide Aptroot & Lücking 2016): Tropical to subtropical. Neotropical (Amazonia, Caribbean, Central America, Central Andes, Eastern South America, Northern Andes, Orinoco, Southern South America), Palaeotropical (lowland Africa, Asia and Oceania) and Australasia.

Key to species in Aotearoa / New Zealand

This key is adapted from Galloway (2007, xcv): “Key 5 Crustose lichens with Perithecia (or perithecia-like apothecia)” starting from couplet 8.

8. *Ascomata* discrete, occasionally ± confluent but not combined in astroma.....9.

9. *Ascomata* combined in stroma with a carbonaceous involucrellum, ascospores 8 per ascus, 3-septate, fusiform-ellipsoid, 18–27 × 7.5–10 µm, thallus and pseudostromata UV-.....*Astrothelium nigratum*

Taxonomy

Astrothelium nigratum (Müll.Arg.) Aptroot & Lücking, *Lichenologist*, 48 (6): 872 (2016)

Mycobank registration: MB#816709

≡ *Astrothelium minus* var. *nigratum* Müll.Arg., *Bot. Jahrb. Systm.* 6: 382 (1885)

Mycobank registration: MB#454624

Type: Cuba, Wright s.n. (G!—holotype; FH-TUCK 3982—isotype, not seen; Müeller, *Verr. Cub.* 638)

= *Trypethelium bicolor* var. *pyrenuloides* C.Knight, *Trans. N.Z. Inst.*, 16: 405 (1884)

Mycobank registration: MB#608643

Type: New Zealand, *Sine loco* [probably Wellington (see comments about Knight collections by Galloway 2013)], ‘*Ad cortices arborum vivorum*’ Charles Knight (Holotype fide Aptroot & Lücking [2016]; Figures 2A and 2B), WELT, Knight Lichen Herbarium KLH250, Folio 20-, Specimen 21-7, labelled in hand of Charles Knight “*Trypethelium [bicolor v[ar.]] pyrenuloides* sp. nov.”. This collection includes an exquisite hand-coloured drawing of a cross-section of the *ascomata*, and pencil drawings of the thallus cell structure, ascus and an ascospore, and a solitary dried specimen in a folded packet. The illustrations are exact matches for those in the protologue of “*Trypethelium bicolor*, sp. n.” and “*Var. [sic] pyrenuloides*” (Knight 1884: p. 405).

≡ *Trypethelium phlyctaena* var. *pyrenuloides* (C.Knight) Zahlbr., *Catal. Lich. Univ.* 1: 498 (1922)

Mycobank accession number: MB#606848

Description (modified from Aptroot & Lücking [2016] based on UNITEC specimens): *Thallus* firmly attached, corticate, waxy, forming broad bands on phorophyte; cream–yellow to dark orange when fresh, drying orange–brown fading to grey–brown or olive–brown on storage, smooth. *Ascomata* (Figure 1C) usually aggregated in groups of up to 20, sometimes simple, trypethelioid, ostioles apical, diffusely pseudostromatic,



Figure 2. A. Holotype of *Trypethelium bicolor* var. *pyrenuloides* at WELT. **B.** Charles Knight illustrations of the microscopic features of the lichen. (Photographs: P. J. de Lange.)

(0.2)–0.5–0.7 mm diameter, immersed–erumpent, exposed black when fresh, brown–black or grey–black when dry. *Hamathecium* not interspersed, IKI–, filaments mostly branched, anastomosing, 1.0–2.3 μm thick. Asci 8-spored, spores irregularly arranged, cylindrical, 115–135 $\times$ 14–22 μm . Ascospores 8 per ascus (Figures 1D, 1F and 1G), 3-septate, fusiform–ellipsoid, (18)–22.7–(27) $\times$ 7.5–10 μm ($n = 30$), occasionally seen with a perispore up to 8 μm thick, hyaline, IKI– (Figure 1E). Chemistry thallus and pseudostromata UV–, K+ (yellow). TLC: no substances detected. *Pycnidia* not seen.

Distribution: Aotearoa / New Zealand: Te Ika-a-Māui / North Island and Te Waipounamu / South Island from Te Paki south to northwestern Nelson (Pūponga, Wharariki)

(Figure 3). Outside Aotearoa / New Zealand, considered neotropical (Aptroot & Lücking 2016). Galloway (1985, 2007) gave a generic Te Ika-a-Māui / North Island distribution for *Astrothelium nigratum* (as *Trypethelium phlyctaena* and *Trypethelium variolosum*), but we have seen no specimens in those herbaria that we have searched (AK, CHR, OTA [Herbarium acronyms follow Thiers from 2008 onward]) to support that claim. The only specimens we have seen are those from UNITEC cited below.

Representative Specimens: Aotearoa / New Zealand: Te Ika-a-Māui / North Island: Te Hiku o Te Ika, Te Paki, Ngāti Kuri, Tahae / Radar Bush, P.J. de Lange 15843 & D.J. Blanchon, 3 April 2024 (UNITEC 14969); Te Hiku o

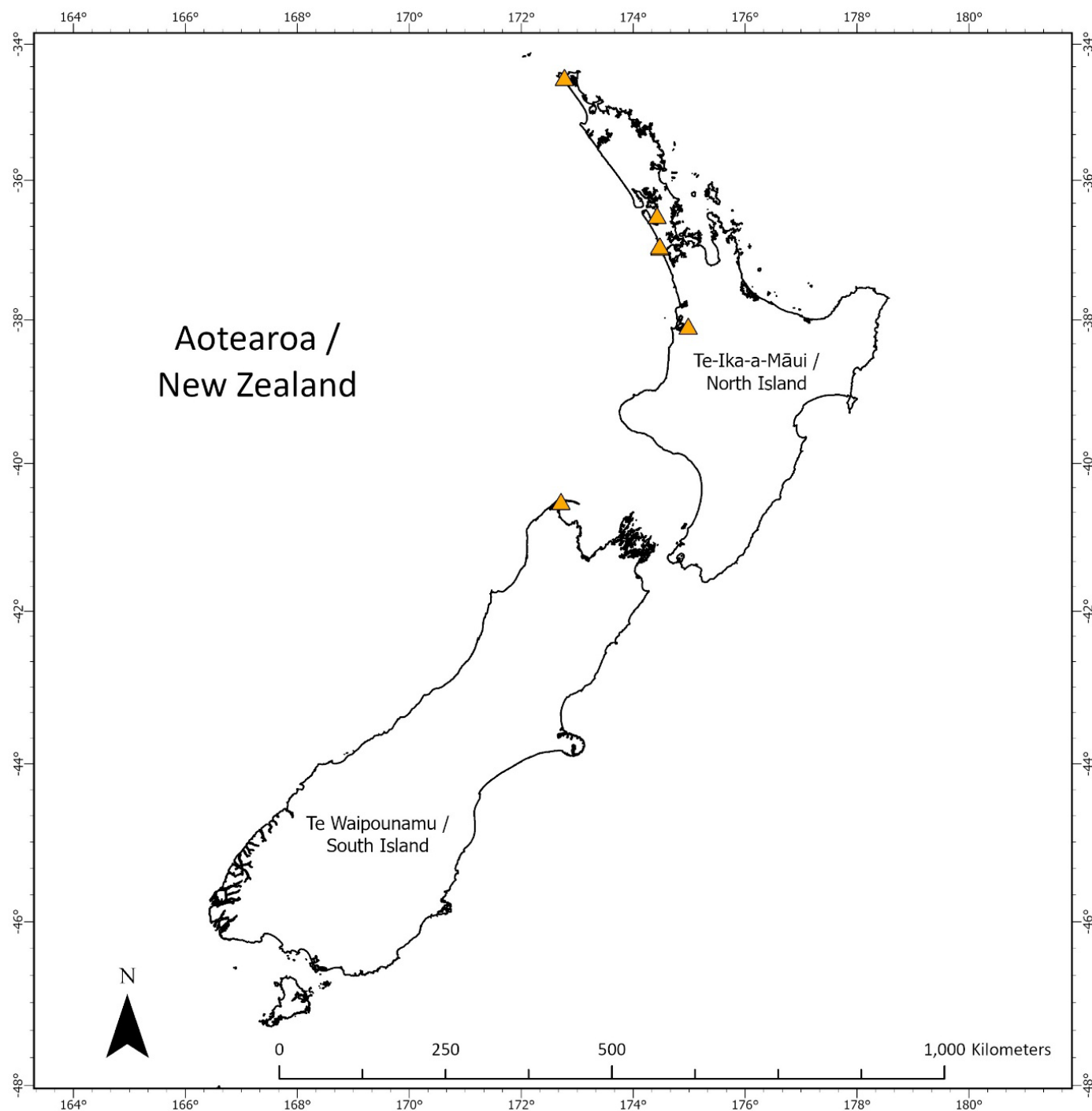


Figure 3. Distribution of *Astrothelium nigratum* based on specimens held at UNITEC and a single iNaturalist observation (<https://inaturalist.nz/observations/224233302>).

Te Ika, Te Paki, Ngāti Kuri, Tahae / Radar Bush, P.J. de Lange 15844 & D.J. Blanchon, 3 April 2024 (UNITEC 14969); Te Hiku o Te Ika, Te Paki, Ngāti Kuri, Tahae / Radar Bush, P.J. de Lange 15845 & D.J. Blanchon, 3 April 2024 (UNITEC 15001); Kaipara, near Glorit, Mataia Farm, Mataia QE II Covenant, Kauri Track, A.J. Marshall s.n. & D.J. Bennett, 11 May 2018 (UNITEC 10180); Kaipara, near Glorit, Mataia Farm, Mataia QE II

Covenant, Kauri Track, A. McKenzie s.n. & D.J. Bennett, 11 May 2018 (UNITEC 10182); Waitākere Ranges, Anawhata Road, A.J. Marshall AJM36 & E.M. Marshall, 2 February 2023 (UNITEC 14968); Waitākere Ranges, Piha, Maungaroa Ridge Track, A.J. Marshall AJM50, 14 March 2023 (UNITEC 14967). TE WAIPOUNAMU / SOUTH ISLAND: Northwest Nelson, Golden Bay, Pūponga Farm Park, Wharariki, Pillar Light Bush, P.J. de Lange 14788

& T.J.P. de Lange, 30 November 2019 (UNITEC 12130); Northwest Nelson, Golden Bay, Pūponga Farm Park, Wharariki, Pillar Light Bush, P.J. de Lange 14798 & T.J.P. de Lange, 30 November 2019 (UNITEC 12158).

Notes: It is not clear why Galloway (2007) referred *Trypethelium bicolor* var. *pyrenuloides* to *Trypethelium variolosum*, i.e. *Astrothelium variolosum*, a species which amongst its many differences has a strong UV+ yellow reaction. The treatment of *Trypethelium bicolor* var. *pyrenuloides* by Aptroot & Lücking (2016) as a synonym of *Astrothelium phylctaena* was made without examining the type, perhaps on the assumption that the initial shift of that variety to *T. phylctaena* var. *pyrenuloides*, by Zahlbruckner (1922), and later its listing as synonym of *T. phylctaena* by Galloway (1985), was correct. We have now examined the type in detail: it matches *Astrothelium nigratum*, critically it is UV- (B. Hatton pers. comm., August 2025) and we can find no other distinctions that would support its treatment as a synonym *Astrothelium phylctaena* or *A. variolosum*. One matter that needs further investigation is that Aotearoa / New Zealand specimens of *A. nigratum* are K+ yellow, whereas the species is reported by Aptroot and Lücking (2016) as K-.

Ecology: In Aotearoa / New Zealand, *Astrothelium nigratum* appears to favour coniferous arborescent phorophytes and so has only been observed in mature and/or regenerating forest supporting these species. Nationally the most common phorophyte is tanekaha (*Phyllocladus trichomanoides* D.Don), followed by kauri (*Agathis australis* (D.Don) Lindl.) and rimu (*Dacrydium cupressinum* Lamb.). Less common phorophytes include monoao (*Halocarpus kirkii* (Parl.) Quinn) and māmāngi (*Coprosma arborea* Kirk), but undoubtedly the species is overlooked on less obvious hosts. Irrespective of phorophyte, *Astrothelium nigratum* appears to favour open forest, where it is often abundant on the trunks of trees that receive the most sunlight during the day. Common associates include species of *Fissurina* Fée, *Lepora* Scop., *Megalania* Hafellner, *Pertusaria* DC., *Metalejeunea cucullata* (Reinw., Blume & Nees) Grolle, *Lejeunea* Lib. and *Frullania* Raddi spp.

Conservation status: *Astrothelium nigratum* is underrepresented in the herbaria of Aotearoa / New Zealand, although this does not mean it is uncommon. Rather, it reflects the difficulty of collection, as samples need to be deeply cut out of the bark of the phorophyte (often iconic and/or threatened species such as kauri and monoao, so collection is met with reluctance), and the fact that this species is only sparingly fertile in Aotearoa

/ New Zealand. Furthermore, as a crustose lichen, *Astrothelium* is less likely to be collected because of the perception by amateur lichenologists that crustose lichens are difficult to identify. Nevertheless, since the 2019 discovery of fertile material at Pillar Light Bush, Wharariki–Pūponga Farm Park (P.J. de Lange 14788 & T.J.P. de Lange, UNITEC 12130), which enabled the species identification, there have been nine observations of this species posted on iNaturalist NZ by P. J. de Lange spanning a range of locations from Tahae / Radar Bush, Te Pahi, south to Pillar Light Bush. Our perception then is that *Astrothelium nigratum* is best assessed as 'Not Threatened' using the New Zealand Threat Classification System (Rolfe et al. 2022), noting that this provisional assessment should be qualified 'DPR' (Data Poor Recognition), 'DPS' (Data Poor Size), 'DPT' (Data Poor Trend) and 'SO' (Secure Overseas), reflecting that the species is difficult to identify in the field, population size and trend is unknown, and that it is widespread and secure overseas.

Acknowledgements

The authors would like to thank the staff of the herbaria throughout Aotearoa / New Zealand who assisted with viewings of collections of the genus, including Tāmaki Paenga Hira Auckland War Memorial Museum (AK), Museum of New Zealand Te Papa Tongarewa (WELT), Manaaki Whenua Landcare Research (CHR) and University of Otago (OTA). Thank you also to Bridget Hatton, Technician, Te Papa Tongarewa (WELT), for checking the UV reactivity of the lectotype of *Trypethelium bicolor* var. *pyrenuloides*. We thank Ngāti Kuri, their taiao team, and Sheridan Waitai in particular, who granted permission to access and assisted with our survey in the Far North, and allowed our disclosure of specimens collected within their rohe; also the Adshead family for permission to survey at the Mataia QEII Covenant. We thank Marley Ford (declared) and Robert Lücking (declared) for their thoughtful review of the submitted manuscript.

Data Accessibility Statement

No additional database.

Author Contributions

Peter J. de Lange: Conceptualisation (lead); data curation (lead); validation (lead); visualisation (lead); writing – original draft (lead); writing – review and editing (lead).

Andrew J. Marshall: Image preparation; data curation; writing – original draft; review and editing.

André Aptroot: Original draft (review and editing).

Dan J. Blanchon: Field assistance; original draft (review and editing).

References

- Aptroot, A., Lücking, R. (2016). A revisionary synopsis of the Trypetheliaceae (Ascomycota: Trypetheliales). *The Lichenologist*, 48(6): 763–982. <https://doi.org/10.1017/S0024282916000487>
- de Lange, P. J., Blanchon, D., Knight, A., Elix, J., Lücking, R., Frogley, K., Harris, A., Cooper, J., Rolfe, J. (2018). Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series* 27. Wellington: Department of Conservation, 64 pp. <https://www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs27entire.pdf>
- Galloway, D. J. (1985). *Flora of New Zealand lichens*. Wellington: Government Printer. 662 pp.
- Galloway, D. J. (2007). *Flora of New Zealand lichens*. Revised 2nd ed. Lincoln: Manaaki Whenua Press. 1006 pp.
- Galloway, D. J. (2013). *A man tenax propositi: Transcriptions of letters from Charles Knight to William Jackson Hooker and Joseph Dalton Hooker between 1852 and 1883*. Geoscience Society of New Zealand Miscellaneous Publication 133J. Wellington: Geoscience Society of New Zealand. 88 pp. <https://gsnz.org.nz/assets/Uploads/Shop/Products/MP133/MP133J.pdf>
- Knight, C. (1884). On the lichenographia of New Zealand. *Transactions of the New Zealand Institute* 16: 400–408.
- Rolfe, J., Hitchmough, R., Michel, P., Mangan, T., Cooper, J. A., de Lange, P. J., Townsend, A. J., Miskelly, C. M., Molloy, J. (2022). *New Zealand Threat Classification System manual 2022, part 1: Assessments*. Wellington: Department of Conservation. 45 pp. <https://www.doc.govt.nz/globalassets/documents/about-doc/oia/2023/december/new-zealand-threat-classification-part-1.pdf>
- Thiers, B. (2008–onward.) *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden. Available online: <http://sweetgum.nybg.org/science/ih> [Accessed: 28 July 2025]
- Zahlbruckner, A. (1922). *Catalogus lichenum universalis* 1. Leipzig: Gebrüder Borntraeger, 696 pp.